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GFA Consulting Group

Micro Pond Technology

Best Practice in Sustainable Land Management (SLM)

May, 2013

Addis Ababa, Ethiopia

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Name of the technology: Micro Pond

2 Detailed description

2.1 Definition

A micro pond is a naturally or artificially constructed pool which is used to collect water during the rainy season. The collected water can later be used for irrigation, human or animal consumption. A micro pond has a capacity to hold up to 100 m³ of water which corresponds roughly to 500 barrels or 100.000 liters. The water can be from various micro-catchment areas through cut-off drains, feeder roads, graded bunds or spillways. Usually, there are two types of micro-ponds, namely watershed micro-ponds and spring-fed micro-ponds. A watershed micro-pond is entirely dependent on rainfall, whereas a spring-fed micro-pond gets the water from springs and road side runoffs.

2.2 Summary description

2.2.1 Criteria for selection

Micro pond was selected as a best practice technology based on the criteria stated in the SLM Best Practices Concept & Manual by the consultant (it needs to be confirmed by the Task Force).

Table 1: Criteria for the assessment of SLM best practices example

Criteria	Points	Comments
Acceptance	3	Fundamental, at least 2 points
Effectiveness	2	Fundamental at least 2 points
Efficiency	2	Fundamental
Relevancy	2	
Sustainability	2	Fundamental
Replicability	3	
Total point	14	
Average rate	2,33	

NB

- **the criteria is at high degree (3)**
- **the criteria is at medium degree (2)**
- **the criteria is at low degree (1)**

The cumulative average rate should be at least 2,0 points to qualify for best practice.

2.2.2 Problem addressed

Sever land degradation in association with intensive run-off has limited the infiltration capacity of rainwater to recharge the underground water and to ensure its availability for plant growth, human and animal consumption. Micro pond is a technology to address water scarcity and associated problems such as loss of biodiversity, reduction in land productivity due to drought, low productivity and decline of soil fertility. The technology is applied in areas without sufficient rain falls and with a need for supplementing irrigation.

2.2.3 Purpose and detailed description

Micro ponds (cemented): useful for small-scale irrigation (supplementary) a few months after the rainy season has stopped. However, un-cemented micro pond is useful mostly during the rainy season as supplementary irrigation and during dry spells to recharge ground water.

There are different designs of micro ponds:

1) Round shaped micro-ponds (cemented and not cemented) > for detail design procedures consult guidelines provided by the MoA/BoA in each region < usually 4-6 meters radius and 3-4 meters deep. The cone of the pond is shortened at its bottom, allowing for 2-3 meters diameter flat bottom. Volume calculated approximately is based on small micro-catchments (400-1000m²), supply of excess runoff from feeder roads, footpaths, small closures, grazing areas, compounds, etc. Use pole and string with knots placed at different diameters based on the size of the pond to facilitate excavation. The bottom and sides of ponds should be tightly stone paved/faced using mortar (cement/sand 1:4), reinforced with mesh and plastered (cement/sand ratio 1:2-3). It is recommended to moist the cemented wall /bottom for 2-3 weeks after construction to avoid cracks of the micro pond.

2) A lower cost micro pond is applicable in areas with medium textured soils to apply clay blankets (20-30 cm) lined and compacted at the bottom to decrease vertical seepage. While applying the clay blanket it needs moisturizing and compacting at every 3 cm. The walls can also be stone faced and plastered using local mortar ("chika") mixed with teff straws, dung and cement (cement: soil ratio is 1: 6-8). This can only reduce lateral seepage and cracks need to be filled every year.

A second option is that in addition to clay blankets, side walls could be built stone stepped to facilitate access. In this case, the stone masonry work should be carefully done, and space between stones filled with mortar. Test these measures at small scale first before dissemination to identify any problems related in such area.

3) Square or rectangular micro ponds: depth (2.5m to 3.5m) - may be larger in size and its side slope approximately 1:1. Re2ctangular ponds are usually cheaper, not cemented and used mostly to supplement water during rainy season (during dry spells).To reduce seepage, a system of stone paving + a clay blanket (10-15cm layer) and/or plastic sheets can be used. Alternatively use local bricks and seal gaps with mortar as explained above. Side walls (faced or stone stepped can also be built) to increase stability and reduce lateral seepage. All micro ponds need to be shaded to prevent malaria. A low cost shade is made out of a central pole placed in the middle of the pond linked to "tukul" like wooden frame covered by thatch (using straws) or mats. Micro-pond rainwater harvesting is based on the premise that rainwater should first be used to meet the water needs of the local area. It is a concept of rainfall concentration that multiplies the amount of rainfall on a cropped area by a factor greater than one. At the same time erosion will be controlled and fertility of the soil is managed. This concept differs from the SWC practice, in which there is no rainfall multiplication and concentration.

2.3. Adaptation to different agro-ecological and socio-economic conditions

A micro-pond is suitable to most agro climatic zones except in areas with excessive dryness (below 400 mm rainfall) as it is otherwise not cost effective. It is suitable when hand-dug wells are not available and even after watershed treatment (when water tables are too low).

Figure 1: Micro pond with sediment filtration

3 Benefits and costs

3.1 Benefits

- Provision of separate water supply for livestock.
- Provision of stored water in supplement irrigation for homestead crop production which will be utilised during dry spells that occur within the rainy season but not dry season cultivation.
- Treatment and protection of local micro catchments from erosion; it ensures better moisture retention and improves crop production in areas outside the homestead.
- Makes marginal land productive in food/forage/tree crops production in areas where it is normally impossible.
- Increases yield of rain-fed farming when supplemented during scarcity of rain.
- Minimize risk in drought prone areas (less erosion, ground water recharge, reduce salinity problem).

3.2 Costs

Costs can be calculated based on the material available in the specific locality. The cost of micro pond depends on the availability of labor, the type of the soil and the soil texture.

4 Success and challenges

4.1 Success

This technology was successfully used to supplement irrigation of high value crops in horticulture, fruit tree production, bee keeping and for livestock for a few months. Micro pond allows using surface runoff from small catchment area within and between homesteads, foot paths, small grazing land areas, rocky areas that create gullies if released to open field. It can also collect water from feeder roads, graded bunds and spillways. Water collected form a micro pond can be used during the rainy season as supplementary irrigation or during or after dry spells for 1-2 months additional supply.

4.2 Challenges

Micro pond is not suitable in unstable soils, sandy loam or very expandable soils. Water is not suitable for domestic drinking purposes and may induce water borne diseases including malaria. Sometimes, when sediment filtration is forgotten to be constructed at the entrance of the flood, the micro pond will be easily filled with siltation within a very short period of time and can affect the life span of the structure. Lack of appropriate identification of soil types will result in seepage and instantly drain moisture.

- In years of very little rainfall it is impossible to collect water from the pond.
- It is labor demanding and needs well organized collaboration of the community.
- Loss of productive soil from the cultivated land to catchments areas.
- Micro pond alone is not enough to control run-off and requires additional technology.
- Limited efficiency - only for supplementary irrigation of small plots.
- Failure to construct siltation trap.

5 Sustainability and chances for scaling-up

Micro pond needs demonstration before expansion. It also needs tools for increasing depth and when dealing with rocky subsoil and stone. Micro pond is easy to learn, socially and culturally accepted, effectively adopted, already under use for several years in different ways and taken up as an environmentally friendly technology. It is appropriate for all stakeholders, including socially marginalized groups and provides a promising SLM technology.

6 Conclusion and recommendation

A micro pond is a naturally or artificially confined pool which is used to collect water during rainy season for irrigation, human or animal consumption during dry seasons. Micro pond is a technology which successfully supported many farmers in the drought prone areas of Ethiopia. It also increases water use efficiency and productivity by reduce losses, increases storage, upgrades irrigation, improves nutrient and organic matter cycles improved soil cover and crop cultivation and improved micro-climatic conditions. It supports small-scale land users to sustain and ensure livelihood through little investments, self initiative of land users considering cultural values and norms. As an easy and flexible method, Micro pond is a sustainable solution and has good chances for scaling up.

7 Reference

MoARD; Community based participatory watershed development – a guide line, 2005, Addis Ababa, Ethiopia.